Claims

1. A container device for the long-term storage of hazardous material, particularly for the ultimate disposal of nuclear fuel, comprising

an elongate, cylindrical first containment body (A) having a casing wall (12) and end walls (13A, 13B), the casing wall and the end walls defining a first compartment (14) for accommodating at least one hazardous-material body (F) formed by the hazardous material or containing or supporting the hazardous material, particularly a hazardous-material body comprising a bundle of rod-shaped nuclear fuel elements, the first compartment (14) comprising support means (15, 16) for supporting the hazardous-material body centrally in the first compartment and spaced from the casing wall and the end walls,

passages provided in at least one of the end walls (13A, 13B) of the containment body (A) for the introduction of wet concrete in the first compartment (14) for filling the space between the hazardous-material body (F) and the walls defining the first compartment (14).

2. A container device for the long-term storage of hazardous material, particularly for the ultimate disposal of nuclear fuel, comprising

at least one elongate, cylindrical first containment body (A) having a casing wall (12) and end walls (13A, 13B), the casing wall and the end walls defining a first compartment (14) for accommodating at least one hazardous-material body (F) formed by the hazardous material or containing or supporting the hazardous material, the first compartment (14) comprising support means for supporting the hazardous-material body centrally in the first compartment and spaced from the casing wall and the end walls,

an elongate, cylindrical second containment body (B) having a casing wall (18) and end walls (19A, 19B), the casing wall and the end walls defining a cylindrical second compartment (22), the second compartment comprising support means (21) for supporting the first containment body

(A) centrally in the second containment body and spaced from the casing wall and the end walls of the second containment body, and

passages provided in at least one of the end walls of each of the first and second containment bodies (A, B) for the introduction of wet concrete in the first and second compartments (14, 22) for filling the space between, as regards the first containment body (A), the hazardous-material body (F) and the walls defining the first compartment (14), and, as regards the second containment body (B), the space between the first containment body (A) and the walls defining the second compartment (22).

3. A container device according to claim 2, comprising

an elongate, cylindrical third containment body (C) having a casing wall (24) and end walls (25A, 25B), the casing wall and the end walls defining a cylindrical third compartment (27), the third compartment comprising support means (28) for supporting the second containment body (B) centrally in the third containment body (C) and spaced from the casing wall and the end walls of the third containment body, and

passages provided in at least one of the end walls (25A, 25B) of the third containment body (C) for the introduction of wet concrete in the third compartment (27) for filling the space between the second containment body (B) and the walls defining the third compartment (27).

4. A container device according to claim 3, comprising

an elongate, cylindrical fourth containment body (D) having a casing wall (30) and end walls (31A, 31B), the casing wall and the end walls defining a cylindrical fourth compartment (32), the fourth compartment comprising support means (34) for supporting the third containment body (C) centrally in the fourth containment body (D) and spaced from the casing wall and the end walls of the fourth containment body, and

passages provided in at least one of the end walls of the fourth containment body (D) for the introduction of wet concrete in the fourth

containment body (D) for filling the space between the third containment body (C) and the walls defining the fourth compartment (32).

5. A method for manufacturing a container device for the ultimate disposal of nuclear fuel elements arranged in at least one bundle, e.g. in one or more fuel assemblies (F), wherein the nuclear fuel elements are introduced and fixed in a defined position in an essentially cylindrical container (A), the length of which is substantially larger than the length of the bundle, with a spacing provided between the nuclear fuel elements and the side and end walls (12, 13A, 13B) of the container, and are embedded throughout their length and at their ends in a casting compound, such as concrete, which is caused to fill completely the space between the bundle and the side and end walls (12, 13A, 13B) of the container and spaces between the individual nuclear fuel elements of the bundle.

6. A method according to claim 5, in which the casting compound, e.g. the concrete, is forced into the container under a pressure in the range of 10 to 50 bar through one of the end walls (13A, 13B) and in which excess casting compound is discharged through the opposite end wall or the same end wall.

7. A method according to claim 5 or 6, in which the container (A) is in an underwater position during the introduction of the bundle or bundles in the container and during the embedding of the bundle or bundles in concrete.

8. A method for manufacturing a container device for the long-term storage of hazardous material, particularly nuclear fuel, included in an elongate hazardous-material body, in which

the hazardous-material body (F) is placed in an elongate, cylindrical first containment body (A) having a casing wall (12) and end walls (13A, 13B) and is fixed in a defined central position in the containment body

and spaced from the casing walls and the end walls of the containment body, and

the hazardous-material body (F) in the containment body (A) is embedded throughout its length and at its ends in concrete which is introduced through one of the end walls and caused to completely fill the space between the hazardous-material body and the inside of the containment body (A).

9. A method according to claim 8, in which

the first containment body (A) with the embedded hazardous-material body (F) therein is placed in an elongate, cylindrical second containment body (B) having a casing wall (18) and end walls (19A, 19B) and is fixed in a defined central position in the first containment body (A) and spaced from the casing and the end walls of the first containment body, and

the first containment body (A) is embedded throughout its length and at its ends in concrete which is introduced through one of the end walls (19A, 19B) of the second containment body (B) and caused to fill completely the space between the first containment body (A) and the inside of the second containment body (B).

10. A method according to claim 9, in which

the second containment body (B) with the embedded first containment body (A) therein is placed in an elongate, cylindrical third containment body (C) having a casing wall (24) and end walls (25A, 25B) and fixed in a defined central position in the third containment body and spaced from the casing and the end walls of that containment body, and

the second containment body (B) is embedded throughout its length and at its ends in concrete which is introduced through one of the end walls (25A, 25B) of the third containment body (C) and caused to fill completely the space between the second containment body (B) and the inside of the third containment body (C).

11. A method according to any one of claims 8 to 10, in which the embedding takes place under water.

12. A method according to any one of claims 8 to 11, in which the embedding takes place by introducing a casting compound or concrete into the first containment body through one of the end walls thereof and at a pressure of the concrete in the range of 10 to 50 bar.

13. A method according to claim 12 as dependent on claim 9, in which the embedding of the first containment body (A) takes place by introducing concrete into the second containment body (B) through one of the end walls thereof and at a pressure of the concrete in the range of 10 to 50 bar.

14. A method according to claim 12 as dependent on claim 10, in which the embedding of the second containment body takes place by introducing concrete into the third containment body (C) through one of the end walls thereof and at a pressure of the concrete in the range of 10 to 50 bar.

15. An installation for manufacturing container devices for hazardous material, in particular nuclear fuel elements, the installation comprising

a water basin (40),

equipment for underwater manipulation of hazardous-material bodies (F) holding the hazardous material and components of the container device, including equipment for introducing the hazardous-material bodies in containment bodies (A) serving as casting formwork, and

equipment for underwater introduction of casting compound at high pressure, preferably at least 10 bar, in the containment bodies.